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IS 7405-2 (1984): printed wiring boards, Part 2: Single and double sided printed boards with plain holes [LITD 5: Semiconductor and Other Electronic Components and Devices]



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*Indian Standard*

SPECIFICATION FOR  
PRINTED WIRING BOARDS

PART 2 SINGLE AND DOUBLE SIDED PRINTED  
BOARDS WITH PLAIN HOLES

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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# *Indian Standard*

## SPECIFICATION FOR PRINTED WIRING BOARDS

### PART 2 SINGLE AND DOUBLE SIDED PRINTED BOARDS WITH PLAIN HOLES

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## IS : 7405 ( Part 2 ) - 1984

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*Indian Standard*  
**SPECIFICATION FOR  
PRINTED WIRING BOARDS**

**PART 2 SINGLE AND DOUBLE SIDED PRINTED  
BOARDS WITH PLAIN HOLES**

**0. F O R E W O R D**

**0.1** This Indian Standard ( Part 2 ) was adopted by the Indian Standards Institution on 1 June 1984, after the draft finalized by the Printed Circuits Sectional Committee had been approved by the Electronics and Telecommunication Division Council.

**0.2** This standard is one of the series of Indian Standards which deals with the various types of finished printed wiring boards. The series is divided into separate parts covering information for the designer, recommendations for the users including test methods and requirements for the various types of printed wiring boards, for example, single- and double-sided, multilayer and flexible printed wiring boards. This standard is applicable to single- and double-sided printed wiring boards with plain holes irrespective of their method of manufacture.

**0.3** Assistance has been drawn in preparation of this standard from IEC Pub 326-4 ( 1980 ) Printed boards Part 4: Specification for single and double sided printed boards with plain holes, issued by the International Electrotechnical Commission ( IEC ).

**0.4** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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**1. SCOPE**

**1.1** This standard ( Part 2 ) specifies the characteristics to be assessed and the requirements for single- and double-sided boards with plain holes,

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\*Rules for rounding off numerical values ( revised ).

## **IS : 7405 ( Part 2 ) - 1984**

irrespective of their method of manufacture.

NOTE — It is intended as a basis on which agreements between the purchaser and the vendor may be made. The term 'detail specification' used in the standard refers to such agreements.

### **2. TERMINOLOGY**

**2.1** For the purpose of this standard, the terms and definitions as given in IS : 1885 ( Part 6 )-1978\* shall apply.

### **3. MATERIAL**

**3.1** The printed wiring boards shall be manufactured from materials specified in detail specification and shall conform to relevant Indian Standard.

### **4. CATEGORY**

**4.1** The category of the printed wiring boards shall be specified in terms of environmental severities it shall have to withstand in the detail specification. The recommendations as laid down in IS : 10424-1982† may be followed in this regard.

### **5. MARKING**

**5.1** The marking shall be in accordance with 5 of IS : 7405 ( Part 1 )-1983‡.

**5.2** Additional marking required, if any, shall be specified in the detail specification.

### **6. CLASSIFICATION OF TESTS**

**6.1** All the tests as given in Table 1 shall constitute type tests. Additional tests as given in Table 2 shall also be carried out if specified in detail specification. Tables 1 and 2 are not intended to prescribe a test sequence. The test may be carried out in any sequence unless otherwise specified in the detail specification. The number of samples shall also be specified in the detail specification.

**6.2** The acceptance tests and routine tests shall be specified in the detail specification. The sampling plan and acceptance criterion shall be stipulated in the contract or order.

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\*Electrotechnical vocabulary: Part 6 Printed circuits.

†Guide for design and use of printed wiring boards.

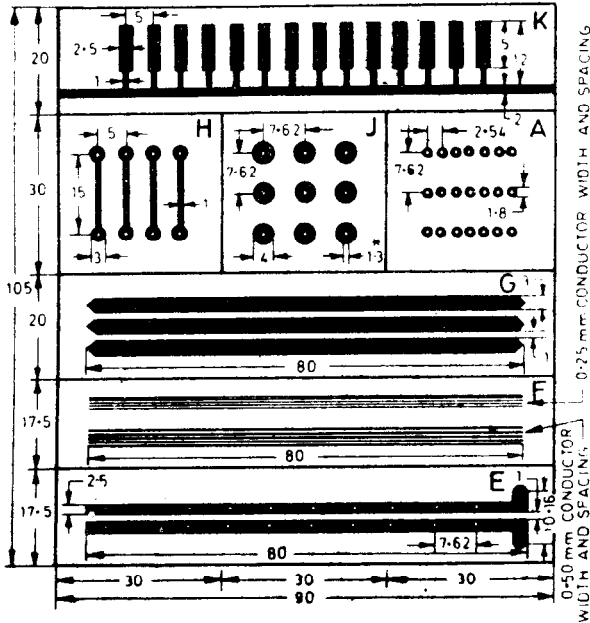
‡Printed wiring boards: Part 1 General requirements and tests.



## 7. TEST SPECIMEN

**7.1** As specified in 6.1 and 7.2 of IS : 7405 ( Part 1 )-1983\* the test shall be carried out on production boards unless otherwise specified.

Where the use of test coupons is agreed, they shall be prepared in accordance with 7.2 of IS : 7405 ( Part 1 )-1983\*. A suitable test pattern is shown in Fig. 1.



\* UNLESS OTHERWISE SPECIFIED, ALL HOLES 0.8 mm DIAMETER.

All dimensions in millimetres.

FIG. 1 COMPOSITE TEST PATTERN

**7.1.1** The composite test pattern of Fig. 1 permits the majority of type approval tests to be carried out on a test board/test coupon. Using the single test specimens, the following tests can be carried out:

- Specimen A : Solderability of lands
- Specimen E : Insulation resistance
- Specimen F : Conductor definition
- Specimen G : Peel strength

\*Printed wiring boards: Part 1 General requirements and tests.

Specimen H : Solderability of surface conductors

Specimen J : Pull-off strength of lands with plain holes

Specimen K : Plating finishes

**8. REQUIREMENTS AND TESTS**

**8.1** The tests and requirements for single-and double-sided printed wiring boards shall be as specified below in Tables 1 and 2. Table 1 specifies the basic characteristics but additional characteristics may be required and shall be selected from Table 2.

**TABLE 1 BASIC CHARACTERISTICS**

( Clauses 6.1 and 8.1 )

SL CHARACTERISTIC No.	TEST No. OF IS : 7405 (PART I)- 1983*	SPECIMEN OF COMPOSITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(6)
<b>I. VISUAL EXAMINATION</b>				
a) Conformity, identification	}	1	Pattern marking, identification and material finishes shall comply with the detail specification. There shall be no apparent defects	
b) Appearance and workmanship		1a Complete composite test pattern	The boards shall appear to have been processed in a careful and workmanlike manner, in accordance with good current practice	
c) Conductor defects		1b	There shall be no cracks or breaks. Imperfections such as voids or edge defects are permissible, provided the conductor width or the leakage path between conductors is not reduced by more than specified in the detail specification, for example, 20 or 35 percent	Where necessary, this shall be verified by dimensional examination, using Test 2a

\*General requirements and methods of test.

( Continued )

TABLE 1 BASIC CHARACTERISTICS — *Contd*

SL. CHARACTERISTIC No.	TEST No. OF IS : 7405 (PART 1)- 1983*	SPECI- MEN OF COMPO- SITE TEST PATTERN	REQUIREMENTS	REMARKS	
(1)	(2)	(3)	(4)	(5)	(6)
d) Particles between conductors	1b or 1c	F	Residual metallic particles are permissible provided the leakage path is not reduced by more than 20 percent or to less than the distance required for the circuit voltages	Where necessary, this shall be verified by dimensional examination, using Test 2a	

## II. DIMENSIONAL EXAMINATION

a) Board dimensions	2		Dimensions and tolerances shall comply with the detail specification  The nominal board thickness shall comply with the detail specification
b) Board thickness in the zone of edge boards contacts	2	K	The total board thickness and the tolerances shall comply with the detail specification
c) Holes	2		Nominal diameter and tolerances of mounting holes and of component holes shall comply with the detail specification
d) Slots, notches	2		The dimensions shall comply with the detail specification

\*General requirements and methods of test.

( Continued )

TABLE 1 BASIC CHARACTERISTICS — *Contd*

Sl. Characteristic No.	TEST No. OF IS : 7405 (PART 1) - 1983*	SPECIMEN OF COMPOSITE TEST PATTERN	REQUIREMENTS	REMARKS
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(1)	(2)	(3)	(4)	(5)	(6)
-----	-----	-----	-----	-----	-----

e) Conductor width

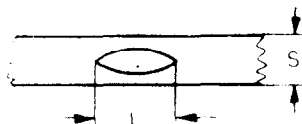
2

The width shall comply with any specific dimensions given in the detail specification

2a

Complete composite test pattern

Imperfections such as voids or edge defects are permissible provided the conductor width is not reduced more than specified in the detail specification, for example, 20 or 35 percent. The length  $L$  of a defect shall not be greater than the conductor width  $S$  or 5 mm, whichever is the smaller ( see figure )



f) Spacing between conductors

2

F

The spacing shall comply with any specific dimensions given in the detail specification

\*General requirements and methods of test.

( Continued )

TABLE 1 BASIC CHARACTERISTICS — *Contd*

SL No.	CHARACTERISTIC	TEST No. of IS : 7405 (PART 1)- 1983*	SPECI-MEN OF COMPO-SITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)
	g) Misalignment of hole and land	1a, 2a	Complete composite test pattern	There shall be no interruption of the land. There shall be no breakout at the junction of the land and the conductor	
	h) Positional tolerances of hole centres			The hole centres shall be within any deviation specified in the detail specification	

## III. ELECTRICAL TEST

a) Insulation resistance	6a	E	The insulation resistance shall comply with the detail specification	Insulation resistance shall be measured before and after environmental conditioning and at elevated temperature, as specified in the detail specification
i) Preconditioning	18a	}		Applicable conditioning to be specified in the detail specification
ii) Measurement at standard atmospheric conditions	6a			
iii) Conditioning as specified in IS : 9000 (Part 4)- 1979† or IS : 9000 (Part 6)- 1978†				
iv) Measurement at elevated temperature	6a			

\*General requirements and methods of test.

†Basic environmental testing procedures for electronic and electrical items:

Part 4 Damp heat (steady state).

Part 6 Composite temperature/humidity cyclic test.

( Continued )

TABLE 1 BASIC CHARACTERISTICS — *Contd*

SL No.	CHARACTERISTIC	TEST No. OF IS : 7405 (PART 1)- 1983*	SPECI- MEN OF COMPO- SITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)
<b>IV. MECHANICAL TEST</b>					
	a) Peel strength		G		
	i) Measurement at standard atmospheric conditions	10a	}	The peel strength shall comply with the detail specification	
	ii) Measurement at elevated temperature	10b			
	b) Pull-strength				
	Pull of strength	11a	J	The land shall not become detached during soldering operation. The pull-off strength shall be not less than the value specified in the detail specification	
	c) Flatness	12a		The radius of curvature shall be not less than the value specified in the detail specification	
<b>V. MISCELLANEOUS TESTS</b>					
	a) Plating finishes				
	i) Adhesion of plating, tape method	13a	K	There shall be no evidence of plating adhering to the tape after removal from the conductor, other than that resulting from overhang	
	ii) Thickness of plating (contact areas)	13f	K	The thickness shall comply with the detail specification	

\*General requirements and methods of test.

( Continued )

TABLE 1 BASIC CHARACTERISTICS — *Contd*

SL No.	CHARACTERISTIC	TEST No. OF IS : 7405 (PART 1) 1983*	SPECIMEN OF COMPOSITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)
	b) Solderability	14a	H, A	The conductors shall be covered with a smooth and bright solder coating with not more than 5 percent approx of scattered imperfections such as pinholes and unwetted or dewetted areas. The imperfections shall not be concentrated in one area	
	i) When the use of a non activated flux is stipulated in contract or order				Non-activated flux as specified in IS : 9000 (Part 18/Sec 3)-1981†
	1) As received condition			<p><i>Wetting</i> : The specimen shall wet within 2 s. When a temporarily protective coating intended to preserve the wettability is used, the specimen shall wet within 3 s</p> <p><i>Dewetting</i> : The specimen shall remain in contact with the molten solder for between 5 and 6 s and shall not have dewetted</p>	
					Applicable conditions to be specified in the detail specification

\*General requirements and methods of test.

†Basic environmental testing procedures for electronic and electrical items: Part 18 Solderability test, Section 3 Solderability of printed boards and metal-clad laminates.

( *Continued* )

TABLE 1 BASIC CHARACTERISTICS — *Contd*

SL No.	CHARACTERISTIC	TEST No. OF IS : 7405 (PART 1)- 1983*	SPECI- MEN OF COMPO- SITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)
	2) After accelerated ageing			<p><i>Wetting</i> : The specimen shall wet within 4 s</p> <p><i>Dewetting</i> : The specimen shall remain in contact with the molten solder for between 5 and 6 s and shall not have dewetted</p>	
	ii) When the use of an activated flux is stipulated in contract or order				Activated flux (0.2 percent) as specified in IS : 9000 ( Part 18/Sec 3 )-1981†
	As in received condition and after accelerated ageing			<p>For boards with or without solderable temporarily protective coating:</p> <p><i>Wetting</i> : The specimen shall wet within 2 s</p>	Applicable conditions to be specified in the detail specification
				<p><i>Dewetting</i> : The specimen shall remain in contact with the molten solder for between 5 and 6 s and shall not have dewetted</p>	

\*General requirements and methods of test.

†Basic environmental testing procedures for electronic and electrical items: Part 18 Solderability test, Section 3 Solderability of printed boards and metal-clad laminates.

( *Continued* )



TABLE 1 BASIC CHARACTERISTICS — *Contd*

SL No.	CHARACTERISTIC	TEST No. OF IS : 7405 (PART 1) 1983*	SPECI-MEN OF COMPO-SITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)
	c) Solvent and flux resistance	17a		<p><i>No sign of :</i></p> <ul style="list-style-type: none"> <li>—blistering or delamination,</li> <li>—random removal of areas of resist or ink,</li> <li>—dissolving, and</li> <li>—substantial change in colour</li> </ul> <p><i>Accept :</i></p> <ul style="list-style-type: none"> <li>a) markings unaffected,</li> <li>b) markings reduced but legible</li> </ul> <p><i>Reject :</i></p> <ul style="list-style-type: none"> <li>a) markings illegible or destroyed,</li> <li>b) markings doubtfully legible, that is, possible mistaking of similar characters such as; R — P — B, E — F, C — G — O</li> </ul>	

\*General requirements and methods of test.

TABLE 2 ADDITIONAL CHARACTERISTICS

( Clauses 6.1 and 8.1 )

SL No.	CHARACTERISTIC	TEST No. OF IS : 7405 (PART 1) 1983*	SPECI-MEN OF COMPO-SITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)
I.	DIMENSIONAL EXAMINATION				
	a) Position of pattern and holes relatives to a datum reference			The position shall comply with any specific details given in the detail specification	This is normally not measured as the important feature is the relationship between pattern and hole which controls the minimum radial land width

\*General requirements and methods of test.

( Continued )

TABLE 2 ADDITIONAL CHARACTERISTICS — *Contd*

Sl No.	CHARACTERISTIC	TEST No. OF IS : 7405 (PART 1)- 1983*	SPECI- MEN OF COMPO- SITE TEST PATTERN	REQUIREMENTS	REMARKS
(1)	(2)	(3)	(4)	(5)	(6)
<b>II. ELECTRICAL TESTS</b>					
	a) <i>Resistance</i>				
	Resistance of conductors	3a		The resistance shall comply with the detail specification	
	b) <i>Current proof</i>				
	Current proof, conductors	5b		The conductors shall not burn out (fuse) and there shall be no overheating as apparent by discolouration	
	c) <i>Voltage proof</i>	7a		There shall be no disruptive discharge	
	d) <i>Frequency drift</i>				
	Conditioning as specified in IS : 9000 ( Part 9 ) - 1978†	8		The frequency drift shall not exceed the limits specified in the detail specification	
<b>III. MISCELLANEOUS TESTS</b>					
	a) <i>Plating finishes</i>				
	i) Adhesion of plating, burnish method	13b		There shall be no evidence of blistering or detachment of the plating	
	ii) Porosity, gas exposure	13c	} K	The requirement specified in the detail specification shall be met	
	iii) Porosity, electrographic test	13d 13e			
	iv) Thickness of plating ( other areas than contact areas )	13f			The thickness shall comply with the detail specification

\*General requirements and methods of test.

†Basic environmental testing procedures for electronic and electrical items : Part 9 Acceleration ( steady state ) test.



# INDIAN STANDARDS INSTITUTION

## Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, NEW DELHI 110002

Telephones: 26 60 21, 27 01 31

Telegrams: Manaksanstha  
( Common to all Offices )

## Regional Offices:

Telephone

*Western : Manakalaya, E9 MIDC, Marol, Andheri ( East ), BOMBAY 400093	6 32 92 95
†Eastern : 1/14 C.I.T. Scheme VII M, V.I.P. Road, Maniktola, CALCUTTA 700054	36 24 99
Southern : C.I.T. Campus, MADRAS 600113	41 24 42
Northern : B69 Phase VII, Industrial Focal Point, S.A.S. NAGAR 160051 ( Punjab )	8 73 20

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